

**GENERAL IMMUNOLOGICAL REACTIVITY OF THE BODY
OF CHILDREN WITH VISION PATHOLOGY**

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The article is devoted to the study of the general immunological reactivity of the body of children with vision pathology at the age from 10 to 16 years in comparison with their conditionally healthy peers (boys and girls) from a secondary school. 118 boys and girls at the age from 10 to 16 years old were involved in the research, 70 children (30 boys and 40 girls) with visual pathology made up the studied group and 48 practically healthy children (24 boys and girls each) from a secondary school who made up the controlled group.

Summarizing the detailed study of the general immunological reactivity of the body of blind and partially sighted children at the age from 10 to 16 years, it is possible to conclude that multidirectional changes and trends to changes in the value of immunological and hematological indicators are mild, it can be assessed as the first degree of disorders. This requires systematic monitoring of children and the use of various physical education exercises, which must be determined on the basis of previous literature data. Methods of physical education as one of the examples developed by us taking into account the gender, condition of the level of vision pathology and general health and other characteristics of these children.

Key words: children from 10 to 16 years old, vision pathology, immunological reactivity of the body.

Connection of the publication with planned research works.

The work was carried out within the framework of the thesis in accordance with the plan of the State Educational Institution «DSPU». The research is a fragment of the SRW «Study of adaptive reactions of the organism formed under the influence of various factors of nature and society», state registration No. 0115U003314.

Introduction.

Human health largely depends on the level of physical development and functional capabilities of the body, the foundations of which are formed in childhood. Currently, social and environmental conditions, as well as difficulties in the organization of medical care, have led to an increase in all types of morbidity [1, 2, 3, 4, 5, 6, 7, 8, 9].

The human immune system protects the body from substances or living bodies (microorganisms), cells, including tumor cells, tissues that bear signs of genetic alienness, i.e. it carries out immunological supervision of the genetic purity of the body, including oncogenic supervision in the human body [1, 2, 3, 4, 5, 6, 7, 8, 9].

By origin, immunity is divided into innate (hereditary, species), acquired (adaptive) and specific [1, 2, 3, 4, 5, 6, 7, 8, 9].

The essence of the species innate immunity is determined by the biological, genetic feature of the human body. It is non-specific, persistent, lifelong, transmitted from generation to generation by heredity, associated with the features of a particular person's genotype, and includes many indicators. It is characterized by the stability of the absolute and relative number of the main populations of immune cells (IC), the physiological state, the cellular reactivity of the organism, and the general immunological reactivity of the organism. Indicators of the absolute and relative number of the main populations of immune cells are leading in determining the immunological status of

the organism, factors and mechanisms of non-specific anti-infective protection, adaptive stress, cellular and humoral links of systemic specific immune protection [1, 2, 3, 4, 5, 6, 7, 8, 9].

The severity of the clinical manifestation, the course of the disease, the effectiveness of treatment tactics, rehabilitation measures and prognosis depends on the level of endogenous and exogenous intoxication and immunological reactivity [1, 2, 3, 4, 5, 6, 7, 8, 9].

The aim of the study.

To establish the general immunological reactivity of the body of children with vision pathology at the age from 10 to 16 years in comparison with their practically healthy peers from secondary school.

Object and research methods.

1. *The general research methodology is described in figure.*

2. *Selection of the respondents under the study.* 118 boys and girls at the age from 10 to 16 years were involved in the study, 70 children (30 boys and 40 girls) with visual pathology made up the studied group and 48 practically healthy children (24 boys and girls each) from a secondary school who made up the control group.

3. *Setting benchmarks.* For our research, capillary blood was taken in the morning before eating. The conclusions regarding the effectiveness of the immunological reactivity of the body of children at the age from 10 to 16, blind and partially sighted children were made on the basis of the analysis of integral immunological and hematological indicators of peripheral blood – the value of the index of immunological reactivity, non-specific resistance, lymphocyte index, lymphocyte-granulocyte index, indices of the ratio of the relative number of lymphocytes and monocytes, lymphocytes and eosinophils, the ratio of agranulocytes and ESR and other indices and coefficients.

The level of adaptive stress, the cellular reactivity of the body, the reactive response of neutrophilic polymorphonuclear leukocytes, and the immunological

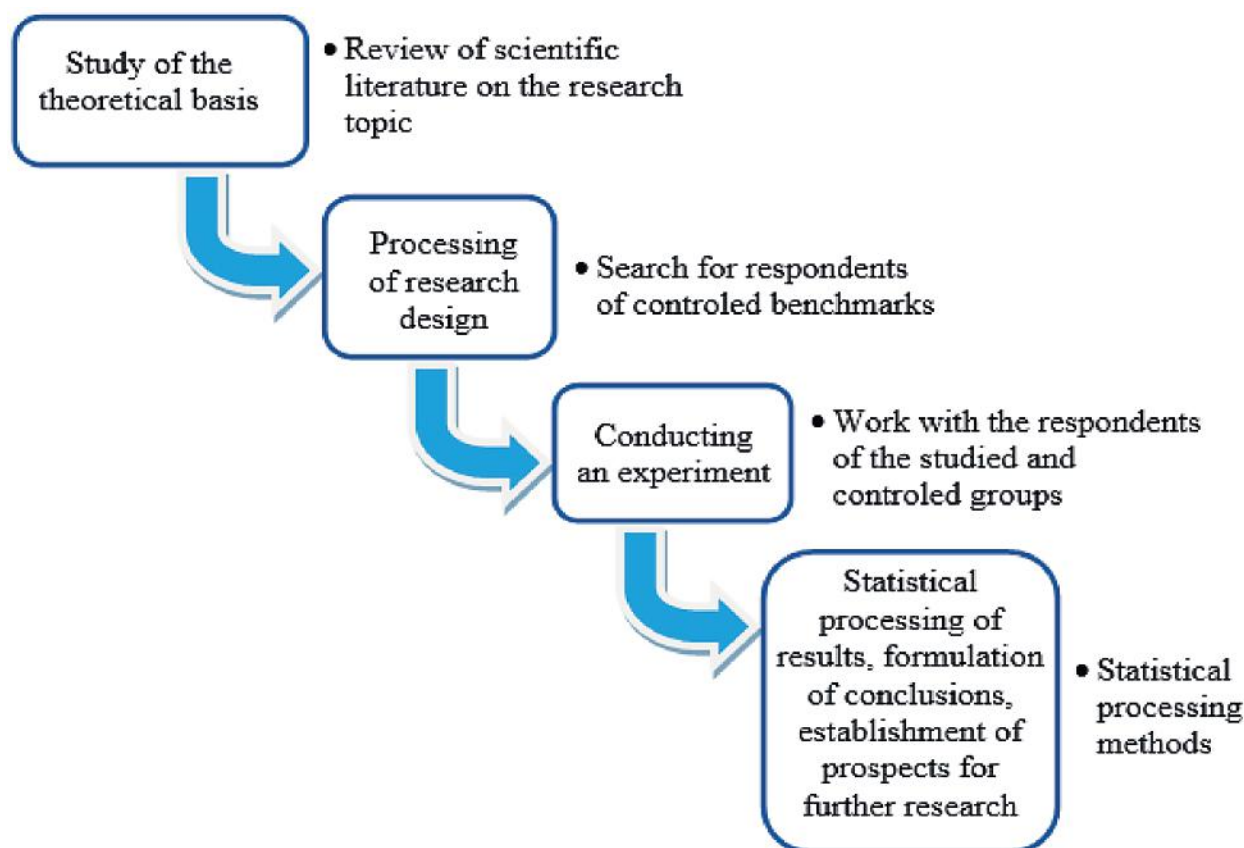


Figure – Results of the study of the general immunological reactivity of the body of children with vision pathology at the age from 10 to 16 years.

reactivity of the body of children with vision pathology were determined using the study of the absolute and relative number of the main populations of immune cells, which was determined by the general analysis of peripheral blood. However, blood for the general analysis was not taken from the finger, so as not to disturb the sensory mechanisms (feeling of touch) of the sensitivity of children with visual defects, but from the ulnar vein. Blood analysis was performed by well-known and globally accepted methods [1, 2, 3, 4, 5, 6, 7, 8, 9].

4. *Statistical processing of results.* Statistical processing of the obtained results was carried out according to known methods of variational statistics with determination of average values (M) and standard error of the arithmetic mean value ($\pm m$). The reliability of data for independent samples was assessed by the Student's t-test, considering the difference to be significant at $p < 0.05$.

5. *Ethical criteria.* The study was conducted in accordance with the provisions of the Council of Europe Convention «On the Protection of Human Rights and Dignity in the Aspect of Biomedicine», «Ethical Principles of Medical Scientific Research Involving Human Subjects», adopted at the 52nd Assembly of the World Medical Association, «General Declaration on Bioethics and human rights», adopted by the resolution of the UNESCO General Conference, the principles of the Helsinki Declaration and in compliance with the current regulatory requirements of Ukraine.

Before the beginning of the study, the parents of all children provided informed written consent for the examination of their children and the use of the obtained data in scientific work.

Research results and their discussion.

The results of the study of the general immunological reactivity of the body of children with vision pathology at the age from 10 to 16 are shown in **table 1**.

In children with vision pathology at the age from 10 to 16 years, a tendency to increase the general immunological reactivity of the body by 3.11% due to a 40.0% increase in the index of the ratio of eosinophils and lymphocytes, which characterizes an increase in the activity of the cellular mechanisms of the body's protection, is confirmed by the tendency to increase (to normal indicators) of the allergy index by 8.33%. At the same time, the level of non-specific reactivity decreases by 5.26%, which is compensated by immune protection, as well as a tendency to decrease the lymphocyte index by 4.88%, the lymphocyte-granulocyte index by 4.25%, and the leukocyte index by 5.52%.

A significant decrease in the index of the ratio of lymphocytes and eosinophils by 40.04% ($P < 0.001$) is characteristic for children with vision pathology, which reflects the advantage of activation of factors and mechanisms of specific immune protection.

Vision pathology in children at the age from 10 to 16 years is accompanied by a tendency to increase the leukocyte shift index by 4.10%, the leukocyte-lymphocyte ratio by 3.40%, and the index of the ratio of leukocytes to ESR by 8.57%, which is a confirmation of the presence of mild intoxication due to non-infectious process, but an autoimmune mechanism.

The dynamics of multidirectional changes in immunological indicators, which characterize the general nonspecific immunological reactivity of the body of children with vision pathology at the age from

Table 1 – General immunological reactivity of the body of children with vision pathology in the age category from 10 to 16 years

Immuno-hematological indicators	Units of measurement	Children with visual pathology n=70	Practically healthy children n=48	The degree of violations of the reactive response	P
		M±m	M±m		
Index of immunological reactivity	con. units	4,64±0,23	4,50±0,18	+I	>0,05
Index of non-specific reactivity of the organism	con. units	42,95±0,37	45,21±0,29	-I	<0,05
Lymphocyte-granulocyte index	con. units	4,00±0,05	4,17±0,04	-I	<0,05
Lymphocyte index	con. units	0,41±0,01	0,43±0,01	-I	>0,05
Leukocyte shift index	con. units	2,03±0,14	1,95±0,12	+I	>0,05
Lymphocyte index	con. units	1,59±0,09	1,63±0,07	-I	>0,05
Allergization index	con. units	0,78±0,08	0,72±0,05	+I	>0,05
Lymphocyte ratio index and monocytes	con. units	4,33±0,15	4,28±0,06	+I	>0,05
Index of the ratio of lymphocytes and eosinophils	con. units	14,24±0,16	19,99±0,21	-I	<0,001
Index of ratio of eosinophils and lymphocytes	con. units	0,070±0,005	0,050±0,003	+ II	<0,05
Neutrophil and lymphocyte ratio	con. units	2,43±0,19	2,35±0,17	+I	>0,05
Index of the ratio of neutrophils and monocytes	con. units	10,30±0,23	10,06±0,19	+I	>0,05
Index of the ratio of agranulocytes and ESR	con. units	5,30±0,07	5,81±0,07	-I	<0,01
The index of the ratio of leukocytes and ESR	con. units	0,38±0,03	0,35±0,03	+I	>0,05

10 to 16 years, is found at the level of the first degree of multidirectional (immunodeficiency or hyperfunction) immune disorders, which is evidence of the use of rehabilitation measures for the correction of these disorders with the use of exercises physical culture.

The results of the study of the level of general immunological reactivity of the body of boys with vision pathology at the age from 10 to 16 are shown in **table 2**.

In boys with visual pathology, the index of general immunological reactivity of the body does not undergo changes compared to this indicator in practically healthy boys of the same age.

At the same time, in boys with visual pathology, the leukocyte index decreases significantly ($P<0.01$) by 2.28 times, the index of non-specific reactivity – by 9.64%, the index of the ratio of lymphocytes and monocytes by 42.40%, which characterizes the advantage links of a specific immunological process in general reactivity. At the same time, the index of the ratio of neutrophils and monocytes increases by 7.86%, the index of the ratio of eosinophils and lymphocytes by 40.43%, which indicates

the activation of the immune response in the body of boys.

The result of determining the general immunological reactivity of the body of girls with vision pathology at the age from 10 to 16 years is shown in **table 3**.

In girls with vision pathology at the age from 10 to 16 years, a positive trend towards an increase in general immunological reactivity by 6.0% is formed. At the same time, non-specific reactivity according to the index of non-specific reactivity increases by 2.71% ($P<0.05$), the index of the ratio of eosinophils and lymphocytes increases by 39.92% with a simultaneous decrease in the value of the index of the ratio of lymphocytes and eosinophils by 38.29%, which indicates the development of hyperergic immune reactivity. Along with such changes, the value of leukocyte index decreases by 19.26% in girls with vision pathology aged 10-16 years.

With such changes in the indicators that characterize the general immunological reactivity of the body of girls with vision pathology at the age from 10 to 16 years, the formation develops to an increase in the value of the leukocyte shift index – by 3.09%, the index of the ratio

Table 2 – General immunological reactivity of boys with vision pathology in the age category from 10 to 16 years

Immuno-hematological indicators	Units of measurement	Boys with visual pathology n=30	Practically healthy boys n=24	The degree of violations of the reactive response	P
		M±m	M±m		
Index of immunological reactivity	con. units	4,69±0,27	4,68±0,19	+I	>0,05
Index of non-specific reactivity of the organism	con. units	42,33±0,39	46,41±0,24	-I	<0,01
Lymphocyte-granulocyte index	con. units	3,94±0,12	4,36±0,15	-I	<0,05
Lymphocyte index	con. units	0,41±0,02	0,45±0,01	-I	<0,05
Leukocyte shift index	con. units	2,06±0,15	1,87±0,11	+I	>0,05
Leukocyte index	con. units	0,72±0,08	1,64±0,07	-II	<0,01
Allergization index	con. units	0,76±0,08	0,74±0,07	+I	>0,05
Index of the ratio of lymphocytes and monocytes	con. units	4,39±0,15	4,47±0,07	-I	>0,05
Index of the ratio of lymphocytes and eosinophils	con. units	15,07±0,17	21,46±0,20	-I	<0,001
Index of ratio of eosinophils and lymphocytes	con. units	0,066±0,007	0,047±0,005	+ II	<0,05
Neutrophil and lymphocyte ratio	con. units	2,47±0,20	2,25±0,18	+I	>0,05
Index of the ratio of neutrophils and monocytes	con. units	10,84±0,33	10,05±0,21	+I	<0,05
Index of the ratio of agranulocytes and ESR	con. units	5,22±0,31	6,03±0,34	-I	>0,05
The index of the ratio of leukocytes and ESR	con. units	0,38±0,04	0,34±0,03	+I	>0,05

Table 3 – General immunological reactivity of girls with vision pathology in the age category from 10 to 16 years

Immuno-hematological indicators	Units of measurement	A girl with vision pathology n=40	Practically healthy girls n=24	The degree of violations of the reactive response	p
		M±m	M±m		
Index of immunological reactivity	con. units	4,59±0,31	4,33±0,27	+I	>0,05
Index of non-specific reactivity of the organism	con. units	43,58±0,41	42,43±0,27	+I	<0,05
Lymphocyte-granulocyte index	con. units	7,65±0,31	7,71±0,36	-I	>0,05
Lymphocyte index	con. units	0,42±0,03	0,42±0,02	-	>0,05
Leukocyte shift index	con. units	2,00±0,14	1,94±0,12	+I	>0,05
Leukocyte index	con. units	1,35±0,04	1,61±0,07	-I	<0,05
Allergization index	con. units	0,80±0,09	0,73±0,07	+I	>0,05
Index of the ratio of lymphocytes and monocytes	con. units	4,28±0,16	4,11±0,12	+I	>0,05
Index of ratio of eosinophils and lymphocytes	con. units	13,58±0,15	18,78±0,21	-I	<0,001
Index of the ratio of eosinophils and lymphocytes	con. units	0,074±0,007	0,053±0,004	+ II	<0,05
Neutrophil and lymphocyte ratio	con. units	2,39±0,24	2,36±0,18	+I	>0,05
Index of the ratio of neutrophils and monocytes	con. units	10,23±0,47	9,69±0,97	+I	>0,05
Index of the ratio of agranulocytes and ESR	con. units	5,38±0,47	5,61±0,37	-I	>0,05
The index of the ratio of leukocytes and ESR	con. units	0,96±0,10	0,95±0,07	+I	>0,05

of leukocytes and monocytes by 4.14%, the index of the ratio of neutrophils and monocytes – by 5.57%.

Conclusions.

Diverse changes in the values of immunological and hematological indicators characterizing the level of general non-specific and specific immune reactivity of the body of girls with vision pathology at the age from 10 to 16 years are the first stage of immune disorders and

do not require medical correction, but only monitoring and the use of various physical manipulations in this category of patients education.

Prospects for further research.

The main scientific provisions presented in this article are the basis for the next stage of research on the impact of rehabilitation physical education on the body's reactivity.

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ЗАГАЛЬНА ІМУНОЛОГІЧНА РЕАКТИВНІСТЬ ОРГАНІЗМУ ДІТЕЙ З ПАТОЛОГІЄЮ ЗОРУ

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Резюме. Імунна система людини забезпечує захист організму від речовин, або живих тіл (мікроорганізмів), клітин, в тому числі пухлинних, тканин, які несуть на собі ознаки генетичної чужерідності, тобто вона здійснює імунологічний нагляд за генетичною чистотою організму, включаючи онкогенний нагляд в організмі людини.

За походженням імунітет поділяють на вроджений (спадковий, видовий), набутий (адаптивний) і специфічний.

Мета нашого дослідження полягала у встановленні загальної імунологічної реактивності організму дітей з патологією зору віком 10-16 років в порівнянні з їх практично здоровими однолітками із загальноосвітньої школи.

Об'єкт і методи дослідження. Респондентами дослідження виступили діти з патологією зору та умовно здорові хлопчики та дівчатка у віковій категорії 10-16 років. Було сформовано 2 групи респондентів: досліджувана та контрольна. До досліджуваної групи увійшли 70 дітей (30 хлопчиків та 40 дівчаток) з патологією зору, до контрольної групи увійшли 48 практично здорових дітей (по 24 хлопчиків та дівчаток) загальноосвітньої

школи. Для досліджень проводили забір капілярної крові вранці до вживання їжі. Висновки щодо ефективності імунологічної реактивності організму дітей віком 10-16 років із патологією зору робили на підставі аналізу інтегральних імуно-гематологічних показників периферичної крові – значення індексу імунологічної реактивності, неспецифічної резистентності, лімфоцитарного індексу, лімфоцитарно-гранулоцитарного індексу, індексів співвідношення відносної кількості лімфоцитів і моноцитів, лімфоцитів та еозинофілів, співвідношення агранулоцитів і ШОЕ та інших індексів і коефіцієнтів.

Рівень адаптаційної напруги, клітинної реактивності організму, реактивну відповідь нейтрофільних поліморфоядерних лейкоцитів і імунологічну реактивність організму дітей з патологією зору визначали за допомогою дослідження абсолютної і відносної кількості основних популяцій імунних клітин, яка визначалася за загальним аналізом периферичної крові. Однак, кров для виконання загального аналізу брали не з пальця, щоб не порушувати сенсорних механізмів (відчуття дотику) чутливості дітей з дефектами зору, а з ліктьової вени. Аналіз крові проводили загальноновідомими і прийнятими у всьому світі методиками

У дітей з патологією зору віком 10-16 років виявлена тенденція до підвищення загальної імунологічної реактивності організму на 3,11% за рахунок підвищення індексу співвідношення еозинофілів і лімфоцитів на 40,0% який характеризує підвищення активності клітинних механізмів захисту організму, що підтверджується тенденцією підвищення (до нормальних показників) індексу алергізації на 8,33%.

Динаміка різнонаправлених змін імунологічних показників, що характеризують загальну неспецифічну імунологічну реактивність організму дітей з патологією зору віком 10-16 років, виявляється на рівні першого ступеня різнонаправлених (імунодефіциту або гіперфункції) імунних порушень, що є свідченням використання для корекції цих порушень реабілітаційних заходів за примінення вправ фізичної культури.

У хлопчиків з патологією зору індекс загальної імунологічної реактивності організму не зазнає змін стосовно такого показника у практично здорових хлопчиків-однорічків.

Разом з тим, у хлопчиків з патологією зору суттєво знижується лейкоцитарний індекс у 2,28 рази, індекс неспецифічної реактивності – на 9,64%, індекс співвідношення лімфоцитів і моноцитів на 42,40%, що характеризує перевагу ланки специфічного імунологічного процесу в загальній реактивності.

У дівчат з патологією зору віком 10-16 років формується позитивна тенденція до підвищення загальної імунологічної реактивності на 6,0%. Разом з тим, неспецифічна реактивність за індексом неспецифічної реактивності, підвищується на 2,71%, зростає індекс співвідношення еозинофілів і лімфоцитів на 39,92% з одночасним зниженням значення індексу співвідношення лімфоцитів та еозинофілів на 38,29%, що свідчить про розвиток гіперергічної імунної реактивності.

Висновки. Таким чином, різносторонні зміни значень імуно-гематологічних показників, що характеризують рівень загальної неспецифічної та специфічної імунної реактивності організму дівчат з патологією зору віком 10-16 років носить перший ступень імунних порушень і не потребують медикаментозної корекції, а тільки моніторингу і використання у цієї категорії пацієнтів різноманітних маніпуляцій фізичного виховання

Перспективи подальших досліджень. Основні наукові положення, наведені в цій статті, є основою для наступного етапу дослідження з впливу реабілітаційного фізичного виховання на реактивність організму.

Ключові слова: діти 10-16 років, патологія зору, імунологічна реактивність організму.

GENERAL IMMUNOLOGICAL REACTIVITY OF THE BODY OF CHILDREN WITH VISION PATHOLOGY

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Abstract. The human immune system protects the body from substances or living bodies (microorganisms), cells, including tumor cells, tissues that bear signs of genetic alienness, i.e. it carries out immunological supervision of the genetic purity of the body, including oncogenic supervision in the human body.

By origin, immunity is divided into innate (hereditary, species), acquired (adaptive) and specific.

The purpose of our study is to establish the general immunological reactivity of the body of children with vision pathology at the age from 10 to 16 years in comparison with their practically healthy peers from secondary school.

Object and research methods. The respondents of the study were children with vision pathology and conditionally healthy boys and girls in the age category of 10-16 years. Two groups of respondents were formed: studied and controlled. The studied group included 70 children (30 boys and 40 girls) with visual pathology, the controlled group included 48 practically healthy children (24 boys and girls each) from a secondary school. For the research, capillary blood was taken in the morning before eating. The conclusions regarding the effectiveness of the immunological reactivity of the body of children at the age from 10 to 16 years with vision pathology were made on the basis of the analysis of integral immuno-hematological indicators of peripheral blood – the value of the index of immunological reactivity, non-specific resistance, lymphocyte index, lymphocyte-granulocyte index, indices of the ratio of the relative number of lymphocytes and monocytes, lymphocytes and eosinophils, the ratio of agranulocytes and ESR and other indexes and coefficients.

The level of adaptive stress, cellular reactivity of the body, the reactive response of neutrophil polymorphonuclear leukocytes and the immunological reactivity of the body of children with vision pathology were determined by studying the absolute and relative number of the main populations of immune cells, which was determined by a general analysis of peripheral blood. However, blood for the general analysis was not taken from the finger, so as not to disturb the sensory mechanisms (feeling of touch) of the sensitivity of children with visual defects, but from the ulnar vein. Blood analysis was performed by well-known and globally accepted methods.

In children with vision pathology at the age from 10 to 16 years, a tendency to increase the general immunological reactivity of the body by 3.11% due to a 40.0% increase in the index of the ratio of eosinophils and lymphocytes,

which characterizes an increase in the activity of the cellular mechanisms of the body's protection, is confirmed by the tendency to increase (to normal indicators) of the allergy index by 8.33%.

The dynamics of multidirectional changes in immunological indicators, which characterize the general nonspecific immunological reactivity of the body of children with vision pathology at the age from 10 to 16 years, is found at the level of the first degree of multidirectional (immunodeficiency or hyperfunction) immune disorders, which is evidence of the use of rehabilitation measures for the correction of these disorders with the use of exercises physical culture.

In boys with visual pathology, the index of general immunological reactivity of the body does not undergo changes compared to this indicator in practically healthy boys of the same age.

At the same time, in boys with vision pathology, the leukocyte index significantly decreases by 2.28 times, the index of non-specific reactivity by 9.64%, the index of the ratio of lymphocytes and monocytes by 42.40%, which characterizes the superiority of the link of the specific immunological process in the general reactivity.

In girls with vision pathology at the age from 10 to 16 years, a positive trend towards an increase in general immunological reactivity by 6.0% is formed. At the same time, non-specific reactivity according to the index of non-specific reactivity increases by 2.71%, the index of the ratio of eosinophils and lymphocytes increases by 39.92% with a simultaneous decrease in the value of the index of the ratio of lymphocytes and eosinophils by 38.29%, which indicates the development of hyperergic immune reactivity

Conclusions. Thus, the diverse changes in the values of immunological and hematological indicators characterizing the level of general non-specific and specific immune reactivity of the body of girls with vision pathology at the age from 10 to 16 years are the first stage of immune disorders and do not require medical correction, but only monitoring and the use of various physical manipulations in this category of patients education.

Prospects for further research. The main scientific provisions presented in this article are the basis for the next stage of research on the impact of rehabilitation physical education on the body's reactivity.

Key words: children from 10 to 16 years old, vision pathology, immunological reactivity of the body.

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Conflict of interests:

The authors of the article confirm the absence of a conflict of interest..

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A – Work concept and design, **B** – Data collection and analysis, **C** – Responsibility for statistical analysis, **D** – Writing the article, **E** – Critical review, **F** – Final approval of the article.

Received 17.01.2024

Accepted 01.05.2024